DESIGNING GAMEFUL EXPERIENCES USING ALTERNATE REALITY GAMES

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Abstract

Gamification in education has become an effective tool in engaging and motivating students. Developing courses with games in mind results in a game-like experience that effectively addresses the challenges in education, such as collaboration, engagement, and student motivation. Designing a gameful course is a challenge that requires understanding in both the education and game design theory disciplines. What game elements to borrow and how to integrate these elements into the course are questions that need to be answered. The paper proposes using alternate reality games to further enhance student engagement and motivation by integrating the course design into a narrative using game actions to facilitate and inspire collaboration and community formation. The potential for borrowing from ARGs, based on literature and previous work, is discussed and an approach is proposed to highlight this potential.

Introduction

Alternate reality games (ARGs) remain interesting manifestations of games as immersive tools (McGonigal, 2003). An ARG can be defined as a game that uses multiple types of media to create an immersive, narrative-driven experience played by a community of players who collectively solve the puzzles, reconstruct the narrative, and in that way push the game forward. ARGs manifest game characteristics in interesting and creative ways.

Understanding and analysing ARGs to understand what makes them immersive is a valuable exercise, especially when looking at the components of which ARGs comprise. Games are powerful tools for teaching, learning, motivation, skill acquisition, and engagement (Bonsignore, Hansen, Kraus & Ruppel, 2012), and so are ARGs.

Developing complete game experiences can be complex and can require a wide set of skills. In the same way, ARGs can be just as complex. The replicability of the ARG experience is also another challenge facing ARGs in the learning environment (Bonsignore et al., 2012; Jerrett, 2016). Gamification can be a simpler way of using the strengths of games by borrowing the game elements or mechanics and implementing them in a non-game context. Borrowing from games gave rise to the concept of gamification, which can be implemented using gameful design that results in more game-like experiences (Deterding, Dixon, Khaled & Nacke, 2011).

The purpose of this paper is to elaborate on gamification in education, highlighting the challenges gamification attempts to solve and why practitioners choose to borrow from games. A set of game phenomena, which has shown to work in gamification in education, is identified from literature. Providing insight into what research in education considers gameful design to be, the paper will then give background on ARGs, specifically the nature of ARGs. A previous study done as part of a master's dissertation (K. de Beer, 2015) provides the basis for the ARG background as well as the breakdown of the characteristics of an ARG. The paper then provides a parallel between the identified game phenomena in education that has proven effective, and the ARG characteristics that can assist in implementing them in a non-game context through gameful design. This can be achieved by answering the question: *How can the game elements unique to ARGs be used in gameful design?*

Background

A theoretical background is required to provide the framing for the concepts put forth by this paper. Gamification is the concept of using game elements or mechanics in a non-game context (Deterding, Dixon, et al., 2011). Huotari and Hamari state that gamification is the "process of enhancing a service with affordances for gameful experiences in order to support users' overall value creation" (Huotari & Hamari, 2016). Where Deterding, Dixon, et al. focus on gamification alone, Huotari and Hamari expand gamification by stating that it is turning the non-game context into a more gameful experience. The concept of gameful design is designing for gamefulness by making use of game design elements (Deterding, Sicart, Nacke, O'Hara & Dixon, 2011). To make a system or a process gameful is to make it more game-like.

Gamification and education

Gamification has been implemented successfully in various educational contexts and has shown that it effectively engages students (Aguilar, Holman & Fishman, 2015; Barata, Gama, Jorge & Gonçalves, 2013; Boskic & Hu, 2015; De Byl, 2012; Decker & Lawley, 2013; De Santana et al., 2016; Urh, Vukovic & Jereb, 2015; Wood & Reiners, 2012), as well as motivate them (Barata et al., 2013; Bellotti et al., 2013; Caponetto, Earp & Ott, 2014; De Byl, 2012; De Santana et al., 2016; Domínguez et al., 2013; Knutas, Ikonen, Nikula & Porras, 2014; Urh et al., 2015). Gamification is even used to create awareness of specific components within a course (Bellotti et al., 2013) and it has been argued that it increases retention (Decker & Lawley, 2013). Thus, it has been established that gamifying a course will increase motivation for the course, the content, and the usage of systems within the course (such as discussion boards and assessment platforms). Research also shown that a gamified course engages students effectively.

Game elements used in gamification

Literature provides examples of how practitioners gamified their courses. It is important to align the activities and challenges within a course to the game elements (Barata et al., 2013; De Byl, 2012). For example, the usage of game-related terminology from role-playing games for the course content can be a simple way to do this (De Byl, 2012). The game elements should also be integrated into the non-game context (Barata et al., 2013; Wood & Reiners, 2012). There are arguments for making the gamified content non-curricular and voluntary for the students (Decker & Lawley, 2013) so that a student does not feel penalised for not participating within the gamified system. Decker and Lawley also argue that the whole system should be accessible to "casual players" (2013).

Game elements borrowed from games vary to a large extent. Certain elements are easier to implement within a non-game context, such as points (Barata et al., 2013; De Byl, 2012; McDaniel, Lindgren & Friskics, 2012; Moccozet, Tardy, Opprecht & Léonard, 2013), badges (Barata et al., 2013; De Byl, 2012; Decker & Lawley, 2013; McDaniel et al., 2012) and leader boards (Barata et al., 2013; De Byl, 2013; Moccozet et al., 2013; Wood & Reiners, 2012). The manifestation of these elements takes various forms. Points can be awarded to a student for completing tasks, or they can be awarded in the form of player levels (Barata et al., 2013). The use of points, badges, and leader boards

(or PBLs) has been criticised as "lazy gamification", but effectively integrating these elements into the course will still result in an increase in motivation and engagement. Other elements borrowed from games are the concepts of quests or challenges for students (Barata et al., 2013; De Byl, 2012) presented in the gamified system. These quests and challenges can, in turn, award points or badges. Badges can also be implemented more creatively by awarding them for different types of activities, such as individual challenges, group challenges, or completing a series of challenges (Decker & Lawley, 2013). Wood and Reiners implemented customisation to allow students to express their individuality through earning customisation options from participating in the course (completing activities that earn them points and badges) and also allowing students to explore the content of the course (2012). Such exploration results from students seeking more customisation opportunities within the course by trying to earn more points or unique identifiers such as badges.

Narrative or stories are also used in gamified systems (Boskic & Hu, 2015; Erenli, 2012; McDaniel et al., 2012; Stott & Neustaedter, 2013) and allow for the integration of the course content with the game elements. Game elements that facilitate social engagement from the students with one another and the lecturer constitute another effective way of engaging the learners (Boskic & Hu, 2015; De Byl, 2013; Fishman et al., 2013). Enhancing social engagement can be done by gamifying the discussion system so that it rewards participation within the system. Games contain built-in feedback systems, which allow players to see if they are on the right path immediately, whether they are doing something correct or not and whether they are moving towards the intended goal. Fast or rapid feedback is also implemented in gamified systems (Barata et al., 2013; McDaniel et al., 2012; Stott & Neustaedter, 2013). The ability of a player of a game to explore the space of the game (context) and make mistakes within the context is also an invaluable tool for teaching the player how the game functions. The freedom to fail and learning through failing can also be implemented in a gamified course (Fishman et al., 2013; Stott & Neustaedter, 2013). By allowing students to explore the course content by facilitating the exploration and experimentation with game-like elements and experiences, students can learn the content of the course on their own terms and at their own pace.

The reasoning behind using specific game elements

Game elements can reinforce an "intrinsic sense of satisfaction that engaging in creative and productive work can generate" (Decker & Lawley, 2013) and they can "make learning more attractive, captivating and, ultimately, effective" (Caponetto et al., 2014).

By including challenges or quests within the learning experience, students are allowed "freedom with regards to expression of content" (Barata et al., 2013) as the challenges or quests are mostly optional or voluntary within the gamified course. Customisation allows students to build a unique profile through their activities to differentiate themselves from their peers (Wood & Reiners, 2012). Another level of customisation in a gamified course allows students to customise their learning experience based on what manner of learning they feel comfortable with (Boskic & Hu, 2015). Leader boards allow students to compare and contrast their performance with one another (Wood & Reiners, 2012) and can even be used as an entry point into the gamified system (Barata et al., 2013). Awarding students with points or badges can also promote specific behaviour, depending on the course content (McDaniel et al., 2012). Fast or rapid feedback provides a student with instant gratification when completing tasks (Barata et al., 2013).

Crafting game-like experiences by borrowing game elements

The discussed game elements can assist in engendering more complex phenomena found within games such as competition, collaboration, community formation, and the concept of agency or control. Voluntarily collaboration with one another and competition (on an individual or collective basis) is key to intrinsic rewards in higher education (Fishman et al., 2013). Collaboration develops certain skills that are important for learning, and if students can be motivated to use collaborative spaces, they will more easily receive feedback from their peers or the lecturer (Moccozet et al., 2013). When students are motivated to collaborate and help each other (Knutas et al., 2014) the result is enhanced engagement with one another (Boskic & Hu, 2015), which, in turn, supports student autonomy (Aguilar et al., 2015). To get students to collaborate, a community of sorts needs to form. Community formation can be motivated by placing students in a game-like environment that rewards, motivates, and cultivates this behaviour (Aguilar et al., 2015). Allowing students a degree of control over their actions and their environment can empower them to explore the course content. This allows students to set their own pace of learning, resulting in mastery of the content in an individualised manner (Aguilar et al., 2015). An example of this control can be found in gamified systems where students could set their own grading structure (Boskic & Hu, 2015).

Gamification to gameful design

In the education discipline, research has developed its own, but equally accurate, interpretation of gameful design. While the term "gamification" still remains in effect, recent research has started to use the term "gameful" (Aguilar et al., 2015; Caponetto et al., 2014; Domínguez et al., 2013; Fishman et al., 2013). There are various reasons for this change, from avoiding the negative connotation of the term "gamification" (Fishman et al., 2013) to arguing that gameful design is a "step further from gamification" (Aguilar et al., 2015).

This research has shown that, rather than borrowing elements from games and using them to engage and motivate students, a wider focus on game design allows for the crafting of game-like experiences (Fishman et al., 2013). There is also an acknowledgement of the large-scale effort required for these types of experiences as the concept of "game-like experiences". This needs to be kept in mind from the very start of course development (Domínguez et al., 2013). The movement from borrowing game artefacts and applying them to the non-game context (Caponetto et al., 2014) towards developing the course and content from the ground up to be more game-like (Domínguez et al., 2013) results in the structure and the overall learning process to be more able to support intrinsic motivation (Aguilar et al., 2015) and to be more engaging overall.

Making education more game-like

Developing a course from the start with gameful design in mind can allow the lecturer to use the strengths of games. Phenomena found within games, such as collaboration, community formation, and player control, can be implemented within a learning experience by making use of game elements, such as narratives, challenges/quests, and exploration. Understanding ARGs can assist in designing these game-like learning experiences, because ARGs make use of the discussed game elements in unique ways. These implementations result in player behaviour distinctive to ARGs. By understanding how ARGs use these game elements and then implementing them in the game-like learning experience, one can duplicate the success of ARGs in engendering collaboration, motivating community formation, assisting in exploration of information landscapes, and giving the student a sense of control.

Understanding ARGs

Alternate reality games are immersive games (McGonigal, 2003) that make use of multiple types of media (Dena, 2008; Hansen, Bonsignore, Ruppel, Visconti & Kraus, 2013; J. Y. Kim, Allen & Lee, 2008; McGonigal, 2003) to create a complex narrative that is fractured across various platforms (Bonsignore et al., 2012; Dena, 2008; Hansen et al., 2013). Players of an ARG are enticed into the narrative and through collaborative problem solving and community engagement (Gurzick et al., 2011; J. Kim, Lee, Thomas & Dombrowski, 2009; McGonigal, 2003; unfiction inc, 2002) they solve the game puzzles and challenges (Hakulinen, 2013; Hansen et al., 2013) which reward them with further game narrative or more puzzles/challenges. The collaborative process of reconstruction requires players to uncover, collect, interpret, and reassemble the game information, and is required for the game narrative to make sense (Hansen et al., 2013). By solving these game puzzles/challenges, players are rewarded with pieces of narrative, which, when put together, advance the game narrative and the game (Dena, 2008).

Components of an ARG

An in-depth analysis of ARG literature done as part of a master's dissertation (De Beer, 2015) allowed the identification of the characteristics discussed above. From these characteristics, three components were identified that form an ARG. The three components identified in the dissertation are similar to components of an ARG identified by the ARG white paper (Martin et al., 2006, p. 31).

The components are:

- The narrative (called "exposition" in the white paper) – This component includes the pieces of narrative in the ARG, the overarching narrative, as well as how the ARG uses narrative.
- Game actions (called "challenges" in the white paper) – These are the game activities described in game design theory.
- Community and interaction (the white paper just refers to "interaction") – This component describes how players interact and participate with one another and the ARG.

Analysing three ARGs based on the above-mentioned identified components allowed for the creation of a conceptual framework. The framework enables the analysis of ARGs on an abstract level, specifically to aid in the design of ARGs. The framework also sheds light on how the components interact with one another within the ARG. The components identified in ARGs are also seen within gamification in education, as discussed in the background of this paper. It is this distinctive interaction between these components in an ARG that needs to be replicated in the gameful design of education.'
A detailed discussion of the framework for designing and analysing ARGs can be found in De Beer (2015) as well as in De Beer and Bothma (2016), which includes discussion on how the framework was developed.

Gameful design using ARGs

The interaction between these components in an ARG can be replicated in a non-game context such as education. The background has shown that game phenomena, such as collaboration, community formation, competition, and control can manifest within a game-like experience. Implementing the borrowed game elements, similarly to how ARGs implement them within the education context, can result in the components of an ARG manifesting in a non-game context. The following sections will discuss how each of the components exists within an ARG and how they can be used in designing game-like experiences for education.

Narrative

The narrative in ARGs can be described as a type of interactive fiction. Players of an ARG are continuously interacting with the game narrative by looking for clues, pieces of story, or content to explain certain events. Players access these narrative chunks (Dena, 2008) by receiving them from the game, solving puzzles in the game, or constructing their own cohesive narrative. In ARGs, the concept of the "player as producer" plays a large role in how the narrative unfolds. As players collect the narrative chunks, they have to reconstruct the narrative to make sense of it (Gurzick et al., 2011). Players can also "fill in the gaps" by making their own narrative leaps. In the case of an ARG, the game can weave these narrative leaps into the game narrative and make it part of the ARG (Dena, 2008; J. Kim et al., 2009). Players are then responsible for creating narrative content for the game.

Creating a game-like experience in education literature has shown that using a narrative or story engages the students. Making use of "chunking" that is done in ARG narratives can motivate the students to investigate further for "gaps in the story". The process of understanding the narrative also requires of students to evaluate the found information, decide on its relevance, and then integrate it into the already constructed narrative. If the narrative is closely linked to the course content, this exploration can result in the exploration of the course content as well as the narrative. By then searching for the narrative, players will explore the narrative space. If the narrative space is integrated with the course content (thematically, abstractly, or just by providing simple links in the narrative) students will then explore the course content as well.

The narrative in an ARG is also directly linked to the game actions. In the case of ARGs, these are usually puzzles or challenges that are very complex and require players to collaborate and employ a collective detective (unfiction inc, 2002). Game actions in an ARG are similar to the borrowed game elements in gamification. In gamification, the game actions can reward the students with narrative chunks. The awarded points can also be linked to the narrative in the gamified course.

Narrative can lead to more narrative chunks or link to a challenge within the course. Solving the challenge can reward players by providing more narrative content. The reward can also be giving access to more complex challenges, which, in turn, can reward more narrative.

Game actions

Game actions in ARGs are complex puzzles and challenges that players need to solve collectively. These game actions require the community of players to share information with one another to solve the problems. By embedding course content into the puzzles or making the problems they need to solve course-related, students will engage with the course content in order to solve problems and complete game actions. Students can also be motivated to solve problems due to the narrative the puzzle provides as reward, or the narrative context in which the puzzle is found.

By making the game actions related to the course, the solving of the game actions (puzzles or challenges) can result in learning. Game actions can also be embedded within the course, which can inspire students to explore the content to find the game actions.

Game actions can reward players by means of narrative revelations within the gamified course, which can further expand the complete narrative. The narrative can contain course-related content, which can then lead to another puzzle or a narrative reward. As discussed at the end of the narrative section above, challenges or game actions and the different types of narrative pieces, are linked together. It is this interlinked nature that is manifest within ARGs and can be replicated in a gamified course.

Collaboration

In ARGs, the player community forms around the game. This is due to the complexity of the ARG puzzles and the nature of the game narrative. Players are required to collaborate to solve the complex puzzles, as well as construct the narrative (as discussed above). Certain game actions are also designed in such a way that they require players to collaborate to solve them. By using game elements in a gamified course and designing the game-like activities in such a way that it is related to the course content, the collaborative solving of these puzzles will allow students to learn concepts from the course collectively.

Community formation is a product of these collaborative puzzles and a "chunked narrative". Students will form groups around certain challenges to attempt to solve them. If the challenges are widespread, various students can choose to focus on certain challenges within the sub group. This is something that manifests extensively in ARGs (Gurzick et al., 2011).

The freedom of students to explore the course content and to form their own groups around certain challenges results in students having a sense of control. How the narrative is constructed by the community or how the game actions are completed is up to the student community.

Conclusion

This paper presents a concept of using ARG components and game elements to allow a gameful course to manifest ARG-like characteristics. By combining how gamification has borrowed game elements from normal games with how ARGs function, the creator of the gameful course can inspire student collaboration, community formation, engender a sense of control, and motivate students to en-

gage with content integrated into an overall narrative.

The approach proposed in this paper is for use within a gamified course, but has not yet been tested empirically. Narrative integration similar to ARGs has been done in gamified education and was very effective (Boskic & Hu, 2015). Using the conceptual framework for designing and analysing ARGs (K. de Beer, 2015) to design a gameful course will be attempted in future work.

References

Aguilar, S. J., Holman, C., & Fishman, B. J. (2015). Game-Inspired Design Empirical Evidence in Support of Gameful Learning Environments. *Games and Culture*. Retrieved from http://gac.sagepub.com/content/early/2015/08/14/1555412015600305

Barata, G., Gama, S., Jorge, J., & Gonçalves, D. (2013). Improving Participation and Learning with Gamification. In *Proceedings of the First International Conference on Gameful Design, Research, and Applications* (pp. 10–17). New York, NY, USA: ACM. https://doi.org/10.1145/2583008.2583010

Bellotti, F., Berta, R., Gloria, A. D., Lavagnino, E., Antonaci, A., Dagnino, F. M., & Ott, M. (2013). A Gamified Short Course for Promoting Entrepreneurship among ICT Engineering Students. In *2013 IEEE 13th International Conference on Advanced Learning Technologies* (pp. 31–32). https://doi.org/10.1109/ICALT.2013.14

Bonsignore, E., Hansen, D., Kraus, K., & Ruppel, M. (2012). Alternate Reality Games as Platforms for Practicing 21st-Century Literacies. *International Journal of Learning and Media*, 4(1), 25–54. https://doi.org/10.1162/IJLM_a_00086

Boskic, N., & Hu, S. (2015). Gamification in Higher Education: How we Changed Roles. In *European Conference on Games Based Learning* (p. 741). Academic Conferences International Limited. Retrieved from http://search.proquest.com/openview/15e084a1c52fdda173d9af4cf2563d35/1?pq-origsite=gscholar

Caponetto, I., Earp, J., & Ott, M. (2014). Gamification and education: A literature review. In *ECGBL 2014: Eighth European Conference on Games Based Learning* (pp. 50–57). Retrieved from https://books.google.com/books?hl=en&lr=&id=IedEBQAAQBAJ&oi=fnd&pg=PA50&dq=gamification+and+web-based+homeword&ots=bE-jZV2j0Y&sig=LYFuoaGrW1Yuz3chTCW_Ev3XgpE

De Beer, K. (2015). *Analysing Alternate Reality Games based on game design theory to propose a conceptual framework*. Pretoria, South Africa. Retrieved from http://repository.up.ac.za/handle/2263/57381

De Beer, K., & Bothma, T. J. D. (2016). Alternate reality games (ARG) as innovative digital information sources. *Library Hi Tech*. https://doi.org/10.1108/LHT-02-2016-0018

De Byl, P. (2012). Can digital natives level-up in a gamified curriculum. *Future Challenges, Sustainable Futures. Ascilite, Wellington*, 256–266.

De Byl, P. (2013). Factors at Play in Tertiary Curriculum Gamification. *International Journal of Game-Based Learning* (IJGBL), 3(2), 1–21.

Decker, A., & Lawley, E. L. (2013). Life's a game and the game of life: how making a game out of it can change student behavior. In *Proceeding of the 44th ACM technical symposium on Computer science education* (pp. 233–238). ACM. Retrieved from http://0-dl.acm.org.innopac.up.ac.za/citation.cfm?id=2445269

Dena, C. (2008). Emerging Participatory Culture Practices Player-Created Tiers in Alternate Reality Games. *Convergence: The International Journal of Research into New Media Technologies*, 14(1), 41–57. https://doi.org/10.1177/1354856507084418

De Santana, S. J., Souza, H. A., Florentin, V. A. F., Paiva, R., Bittencourt, I. I., & Isotani, S. (2016). A Quantitative Analysis of the Most Relevant Gamification Elements in an Online Learning Environment. In *Proceedings of the 25th International Conference Companion on World Wide Web* (pp. 911–916). Republic and Canton of Geneva, Switzerland: International World Wide Web Conferences Steering Committee. https://doi.org/10.1145/2872518.2891074

Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: defining "gamification." In *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments* (pp. 9–15). New York, NY, USA: ACM. https://doi.org/10.1145/2181037.2181040

Deterding, S., Sicart, M., Nacke, L., O'Hara, K., & Dixon, D. (2011). Gamification. Using Game-design Elements in Non-gaming Contexts. In *CHI '11 Extended Abstracts on Human Factors in Computing Systems* (pp. 2425–2428). New York, NY, USA: ACM. https://doi.org/10.1145/1979742.1979575

Domínguez, A., Saenz-de-Navarrete, J., de-Marcos, L., Fernández-Sanz, L., Pagés, C., & Martínez-Herráiz, J.-J. (2013). Gamifying learning experiences: Practical implications and outcomes. *Computers & Education, 63*, 380–392. https://doi.org/10.1016/j.compedu.2012.12.020

Erenli, K. (2012). The impact of gamification: A recommendation of scenarios for education. In *2012 15th International Conference on Interactive Collaborative Learning (ICL)* (pp. 1–8). https://doi.org/10.1109/ICL.2012.6402106

Fishman, B. J., Deterding, S., Vattel, L., Higgen, T., Schenke, K., Sheldon, L., … Aguilar, S. (2013). Beyond badges & points: Gameful assessment systems for engagement in formal education. *University of Wisconsin, Wisconsin, Madison*. Retrieved from http://blog.gradecraft.com/wp-content/uploads/2014/06/GLS2013-Gameful_Learning_Symposium.pdf

Gurzick, D., White, K. F., Lutters, W. G., Landry, B. M., Dombrowski, C., & Kim, J. Y. (2011). Designing the Future of Collaborative Workplace Systems: Lessons Learned from a Comparison with Alternate Reality Games. In *Proceedings of the 2011 iConference* (pp. 174–180). New York: ACM. https://doi.org/10.1145/1940761.1940785

Hakulinen, L. (2013). Alternate Reality Games for Computer Science Education. In *Proceedings of the 13th Koli Calling International Conference on Computing Education Research* (pp. 43–50). New York: ACM. https://doi.org/10.1145/2526968.2526973

Hansen, D., Bonsignore, E., Ruppel, M., Visconti, A., & Kraus, K. (2013). Designing Reusable Alternate Reality Games. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 1529–1538). New York: ACM. https://doi.org/10.1145/2470654.2466203

Huotari, K., & Hamari, J. (2016). A definition for gamification: anchoring gamification in the service marketing literature. *Electronic Markets*, 1–11.

Jerrett, A. M. L. (2016). *Using an alternate reality game to teach information literacy*. Pretoria, South Africa. Retrieved from http://repository.up.ac.za/handle/2263/57484

Kim, J., Lee, E., Thomas, T., & Dombrowski, C. (2009). Storytelling in new media: The case of alternate reality games, 2001–2009. *First Monday*, 14(6). Retrieved from http://journals.uic.edu/ojs/index.php/fm/article/view/2484

Kim, J. Y., Allen, J. P., & Lee, E. (2008). Alternate Reality Gaming. *Communications of the ACM, 51*(2), 36–42. https://doi.org/10.1145/1314215.1314222

Knutas, A., Ikonen, J., Nikula, U., & Porras, J. (2014). Increasing Collaborative Communications in a Programming Course with Gamification: A Case Study. In *Proceedings of the 15th International Conference on Computer Systems and Technologies* (pp. 370–377). New York, NY, USA: ACM. https://doi.org/10.1145/2659532.2659620

Martin, A., Thompson, B., Phillips, A., Alexander, B., Dena, C., & Barlow, N. (2006). IGDA ARG SIG - *Alternate Reality Games White Paper* (Whitepaper). IGDA ARG SIG. Retrieved from http://archives.igda.org/arg/resources/IGDA-AlternateRealityGames-Whitepaper-2006.pdf

McDaniel, R., Lindgren, R., & Friskics, J. (2012). Using badges for shaping interactions in online learning environments. In *2012 IEEE International Professional Communication Conference* (pp. 1–4). IEEE. Retrieved from http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6408619

McGonigal, J. (2003). This is not a game: immersive aesthetics and collective play. In *Digital arts & culture 2003 conference proceedings*. Melbourne. Retrieved from http://itls.usu.edu/~bshelton/courses/instsim/readings/McGonigal-Imm_Aes_Coll_Play.pdf

Moccozet, L., Tardy, C., Opprecht, W., & Léonard, M. (2013). Gamification-based assessment of group work. In *2013 International Conference on Interactive Collaborative Learning (ICL)* (pp. 171–179). https://doi.org/10.1109/ICL.2013.6644565

Stott, A., & Neustaedter, C. (2013). Analysis of gamification in education. *Surrey, BC, Canada*. Retrieved from http://0-clab.iat.sfu.ca.innopac.up.ac.za/pubs/Stott-Gamification.pdf

Unfiction inc. (2002). The unfiction glossary. Retrieved February 28, 2013, from http://www.unfiction.com/glossary/

Urh, M., Vukovic, G., & Jereb, E. (2015). The model for introduction of gamification into e-learning in higher education. *Procedia-Social and Behavioral Sciences, 197*, 388–397.

Wood, L. C., & Reiners, T. (2012). Gamification in logistics and supply chain education: Extending active learning. Retrieved from https://aut.researchgateway.ac.nz/handle/10292/6202